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**Imamichi**

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(54) **IMAGE PROCESSING APPARATUS, IMAGE PROCESSING METHOD, AND COMPUTER PROGRAM PRODUCT CONFIGURED FOR OUTPUT THROUGH PLURAL OUTPUT UNITS AT CORRESPONDING OUTPUT TIMING**

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(51) **Int. Cl.**

**G06F 15/00** (2006.01)  
**G06F 3/12** (2006.01)  
**G06K 1/00** (2006.01)

(52) **U.S. Cl.** ..... **358/1.13; 358/1.9; 358/1.15**

(58) **Field of Classification Search** ..... None  
See application file for complete search history.

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(57) **ABSTRACT**

An image processing apparatus subjects input image information to a predetermined image processing and outputs the image information. The image processing apparatus includes an UI processor that receives a plurality operation requests for the image information; and a request processor that interprets a combination of an input mode, of a plurality of input modes, which performs input processing, and an output mode, of a plurality of output modes, which performs output processing, and that requests the input processing from the input mode and requests the output processing from the output mode.

**15 Claims, 16 Drawing Sheets**

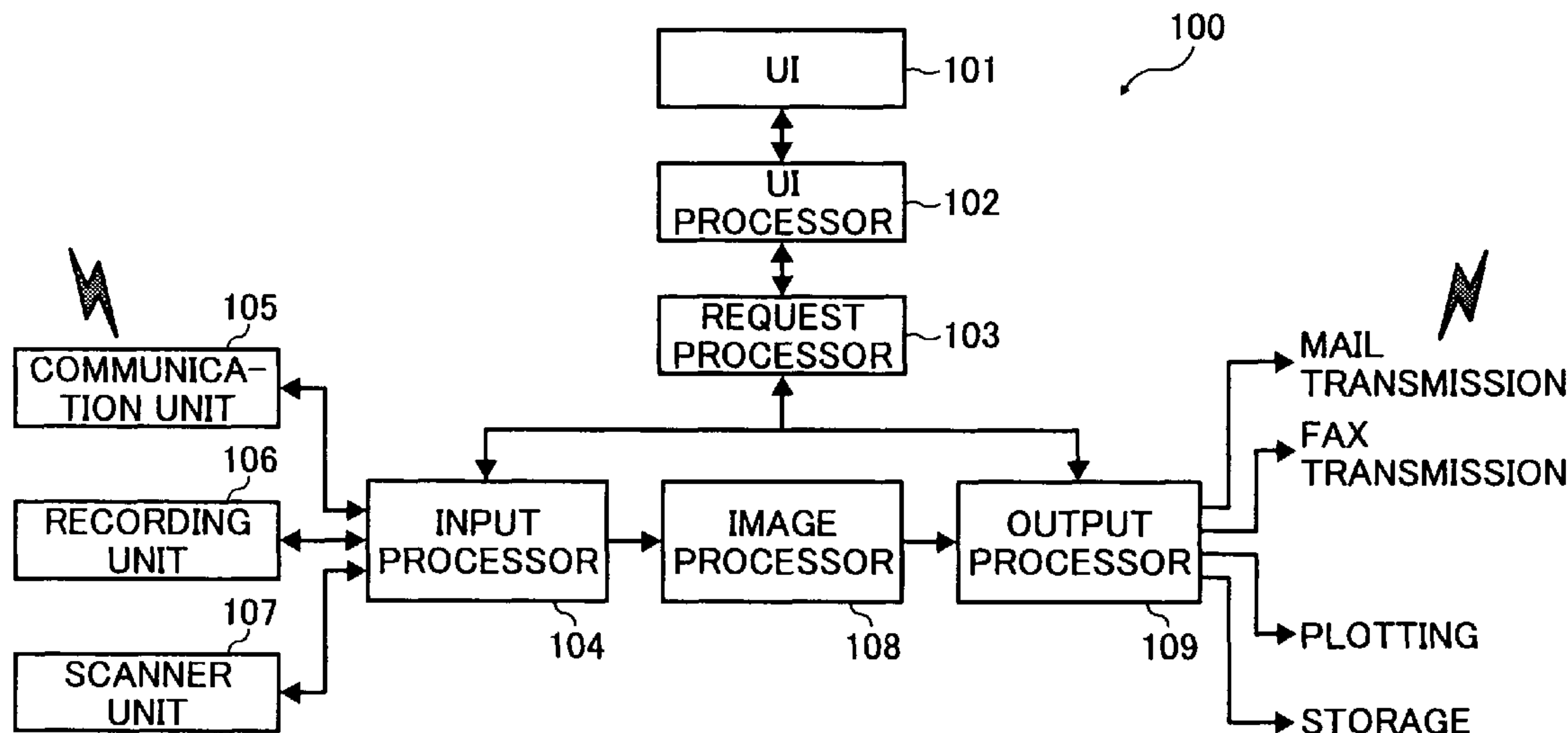


FIG. 1

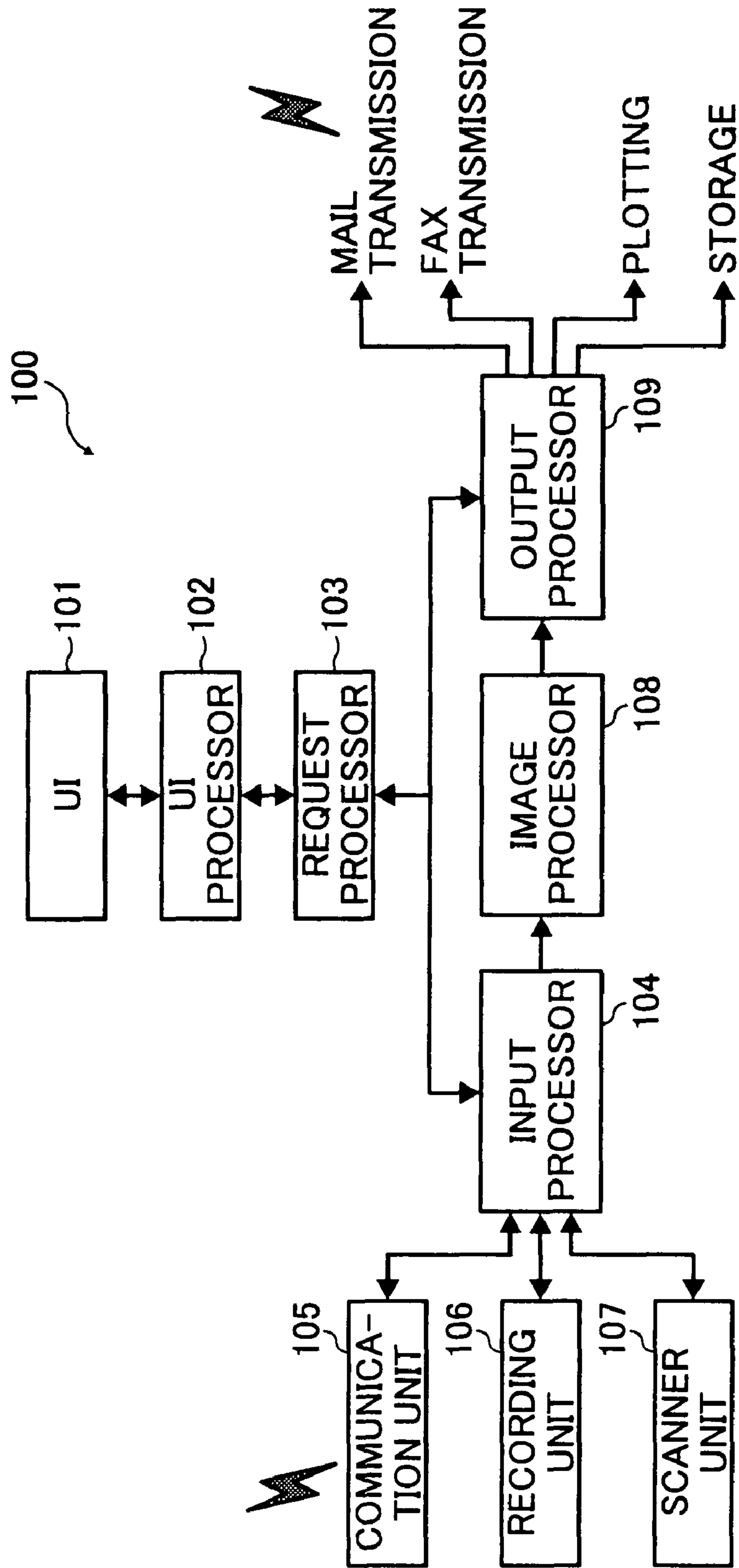


FIG. 2

103

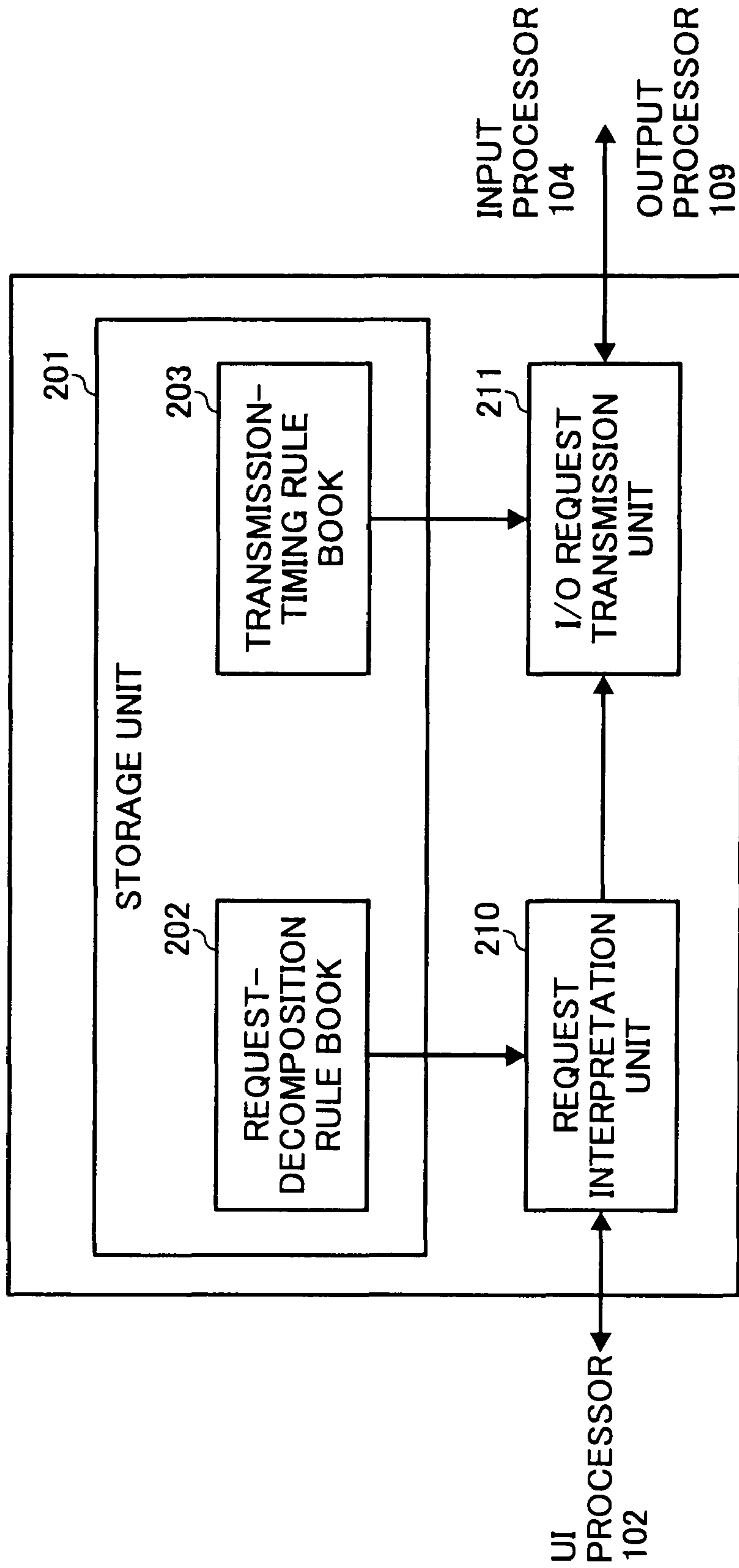


FIG. 3

301 REQUEST	302 INPUT MODE	202 303 OUTPUT MODE
COPY	SCANNING	PLOTTING
FAX	SCANNING	FAX TRANSMISSION
PRINT	RECORDED INFORMATION	PLOTTING
COPY AND FAX	SCANNING	PLOTTING AND FAX TRANSMISSION

FIG. 4

401 INPUT MODE	402 OUTPUT MODE	203 403 TRANSMISSION TIMING
SCANNING	PLOTTING	OUTPUT IS SENT IMMEDIATELY AFTER INPUT IS SENT
SCANNING	FAX TRANSMISSION	OUTPUT IS SENT AFTER INPUT PROCESS IS COMPLETED
RECORDED INFORMATION	PLOTTING	OUTPUT IS SENT IMMEDIATELY AFTER INPUT IS SENT

FIG. 5

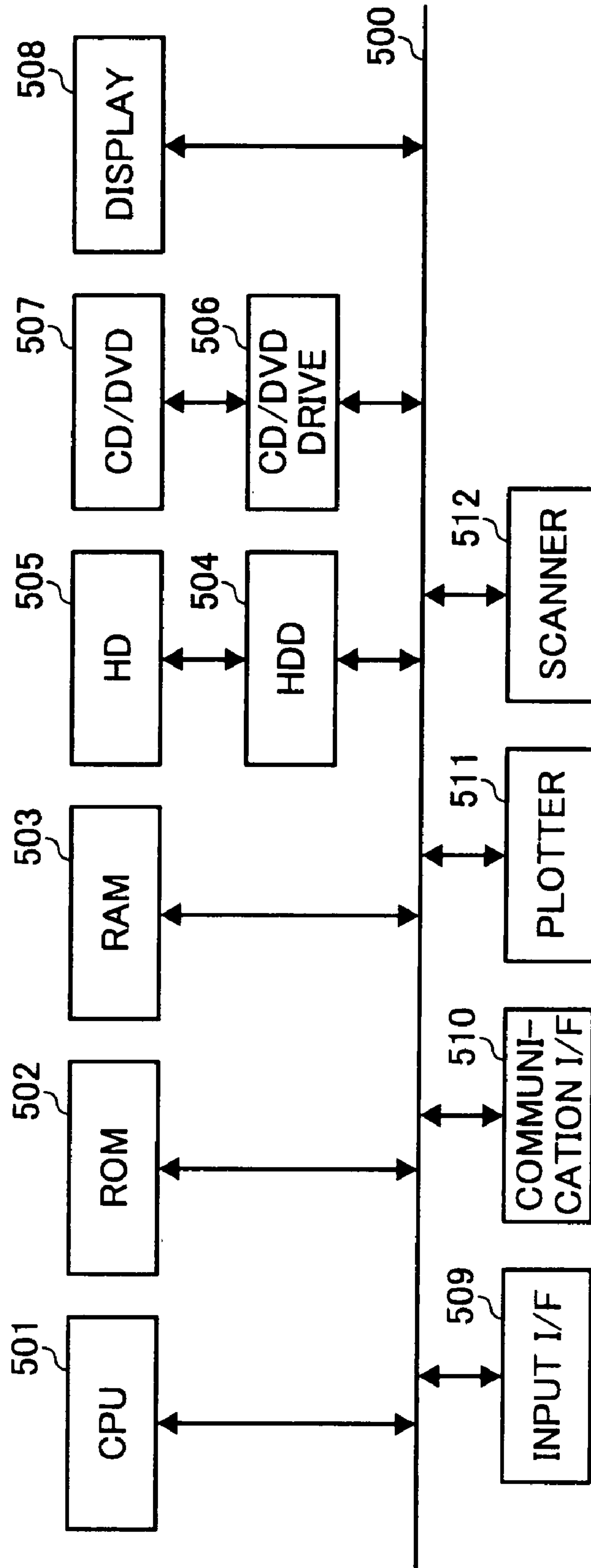


FIG. 6

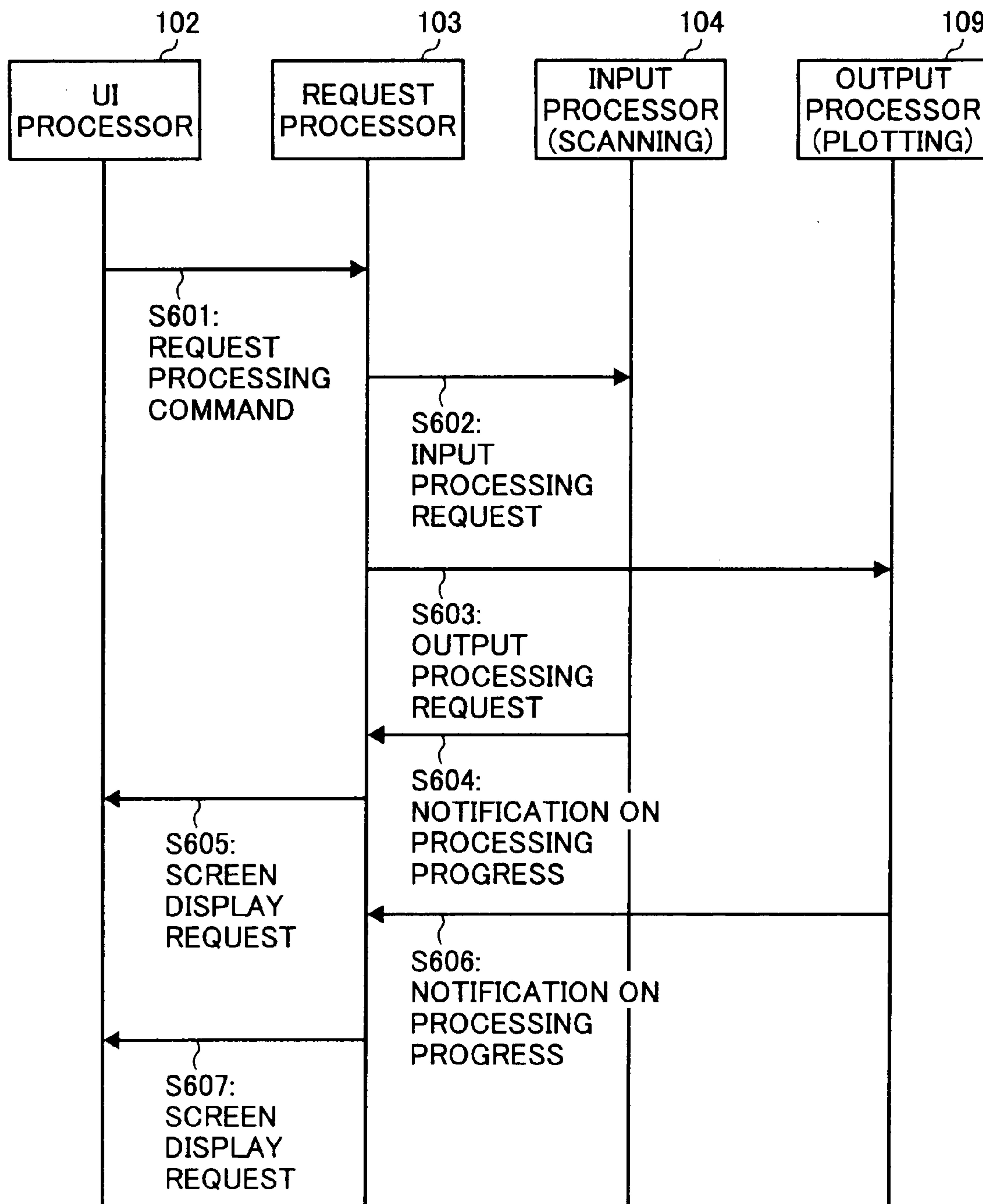




FIG. 7A

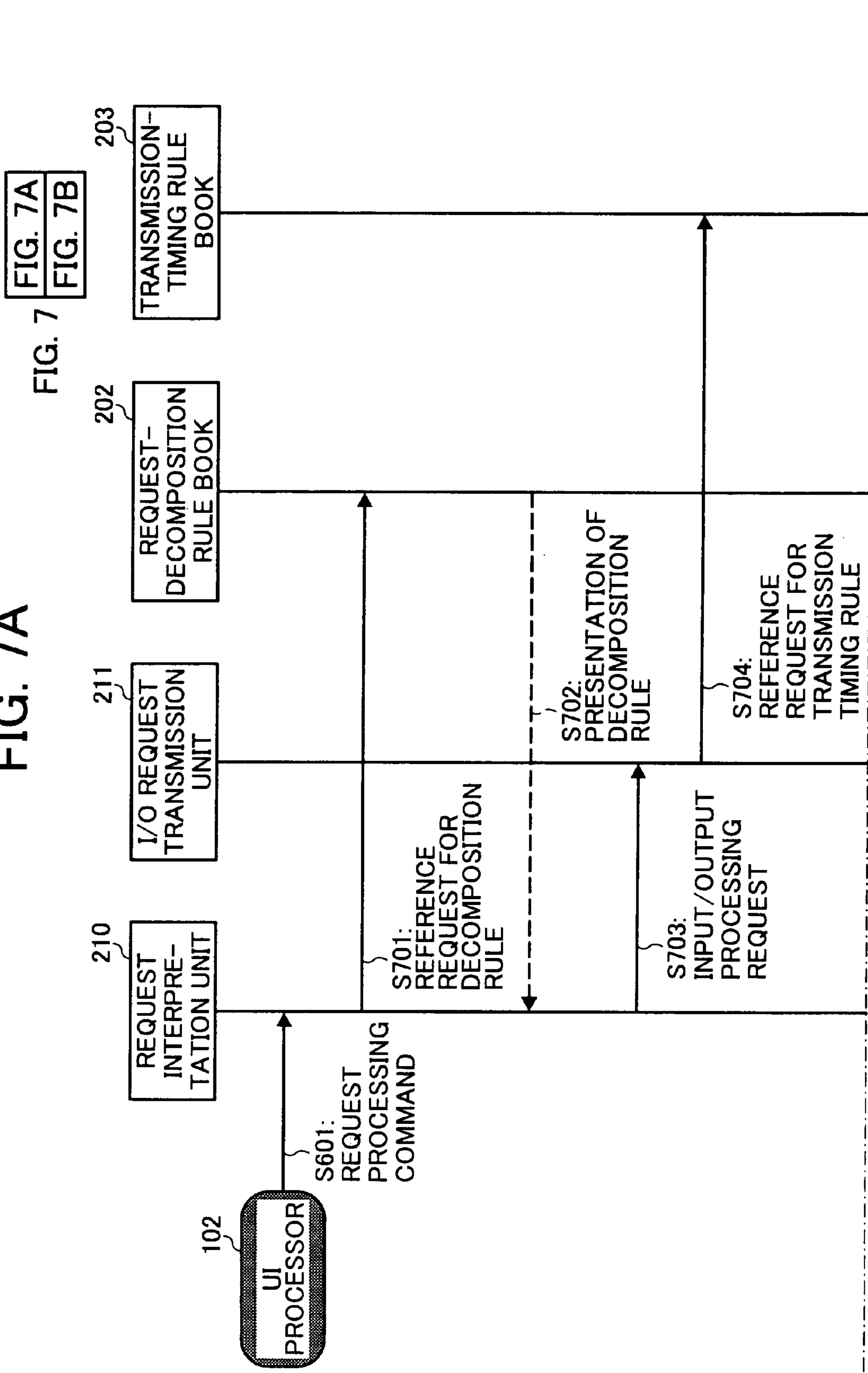


FIG. 7B

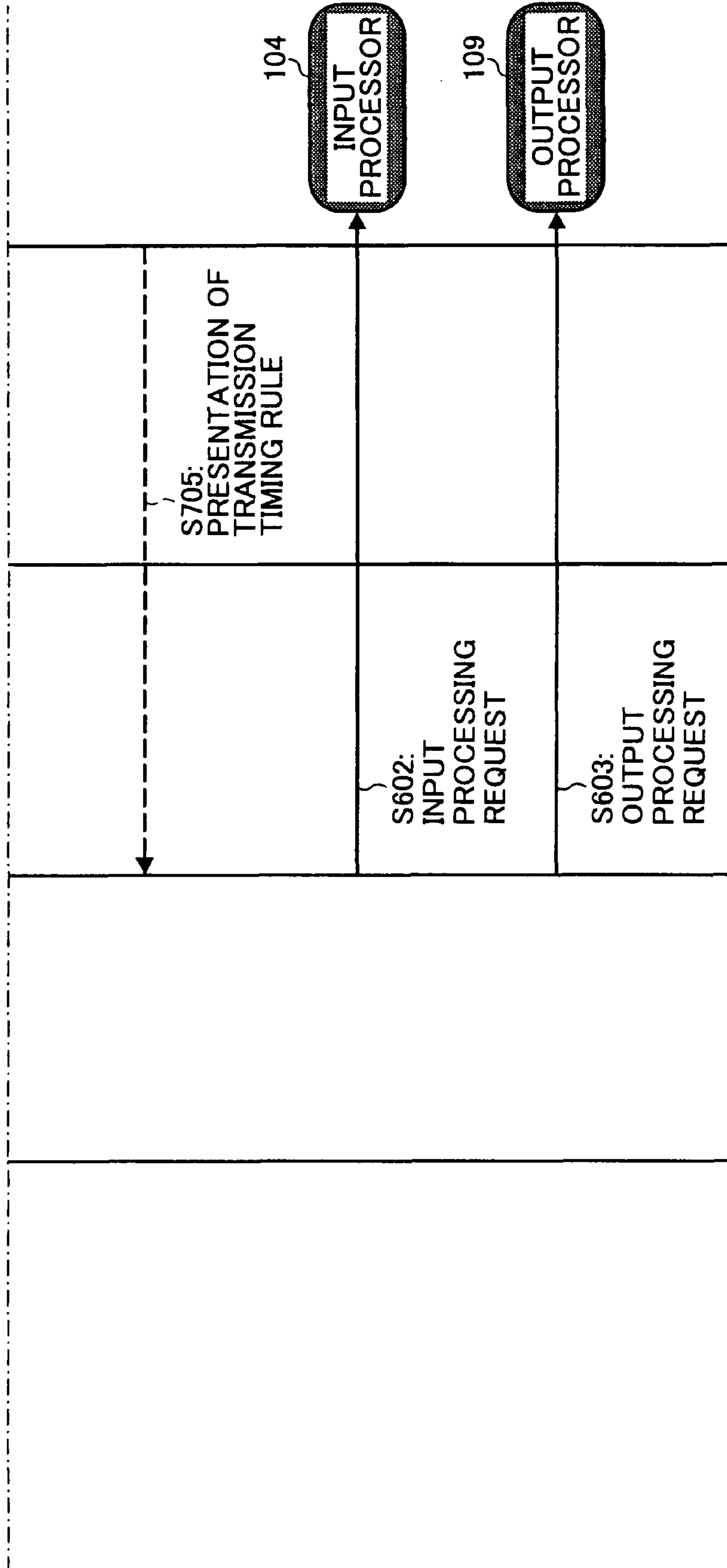




FIG. 8A

FIG. 8A  
FIG. 8B

FIG. 8

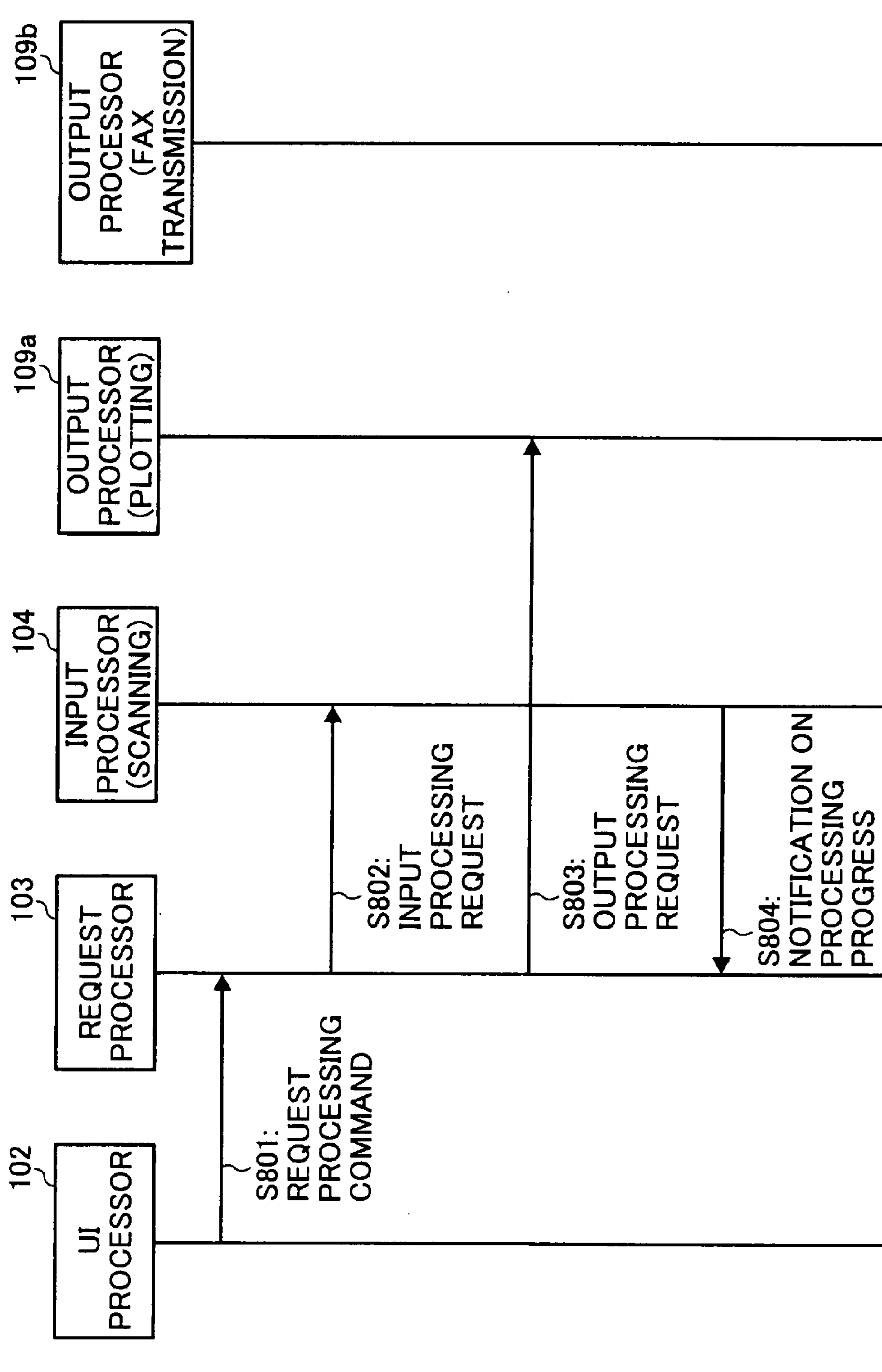


FIG. 8B

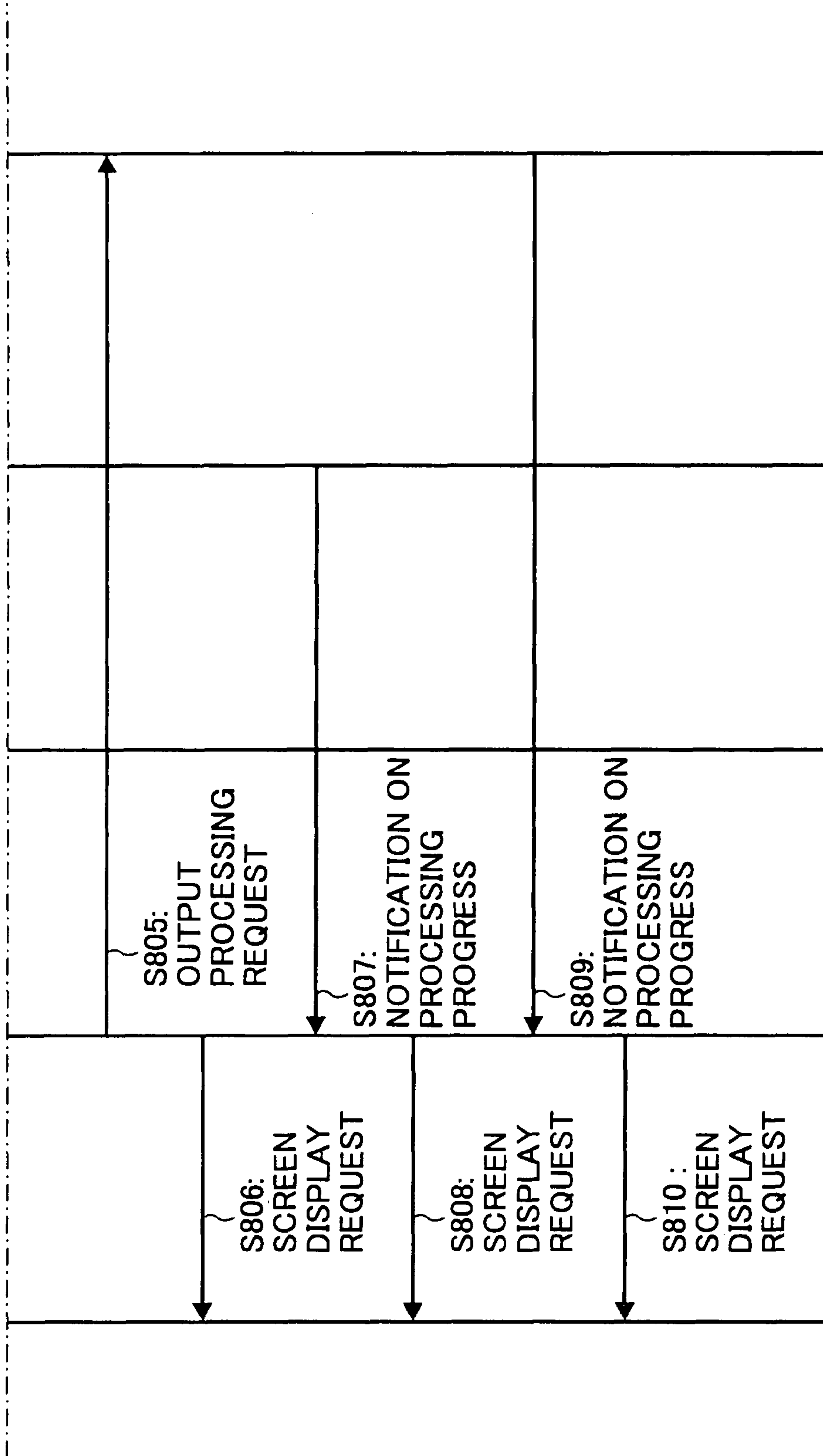


FIG. 9A

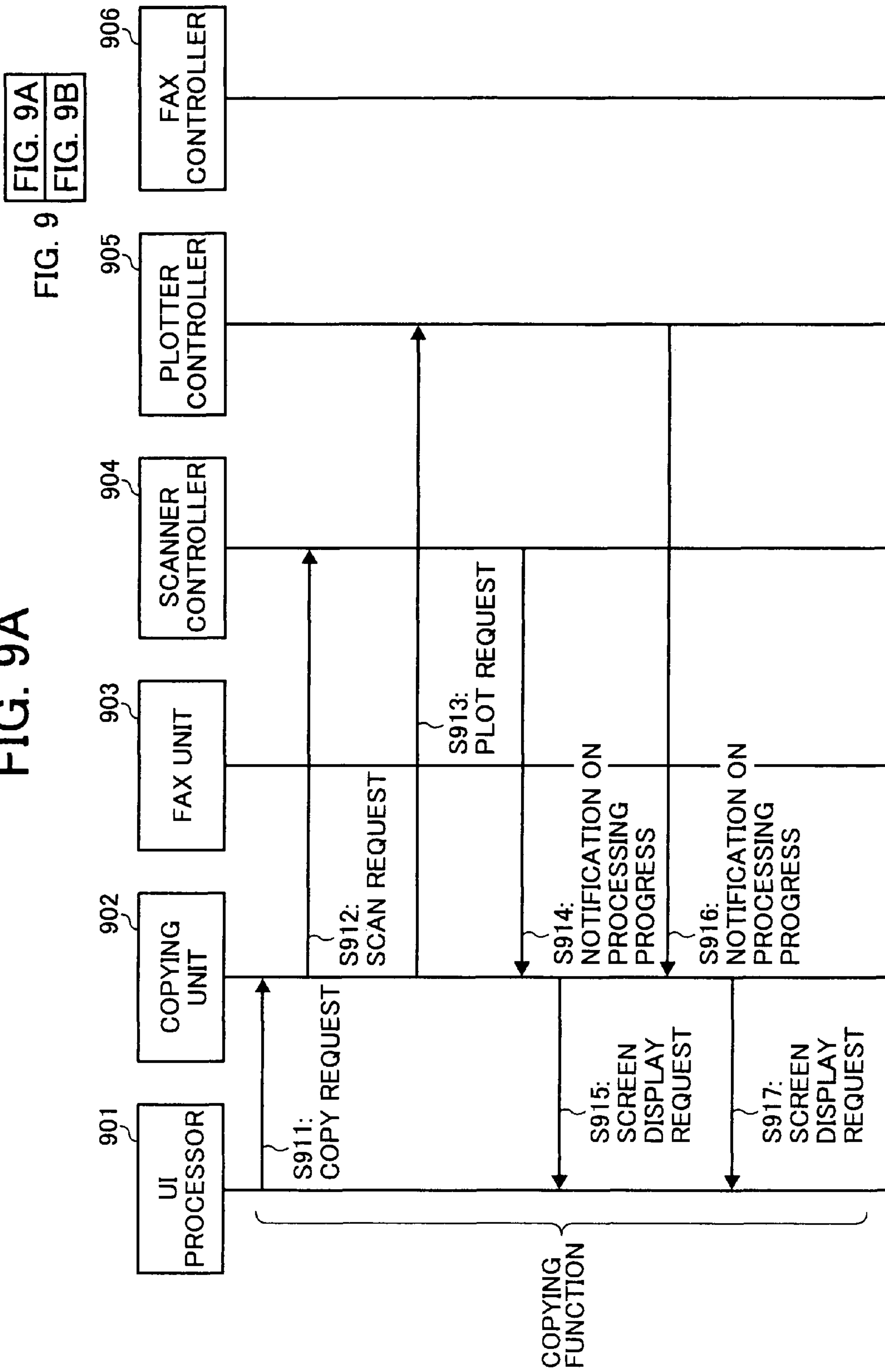


FIG. 9B

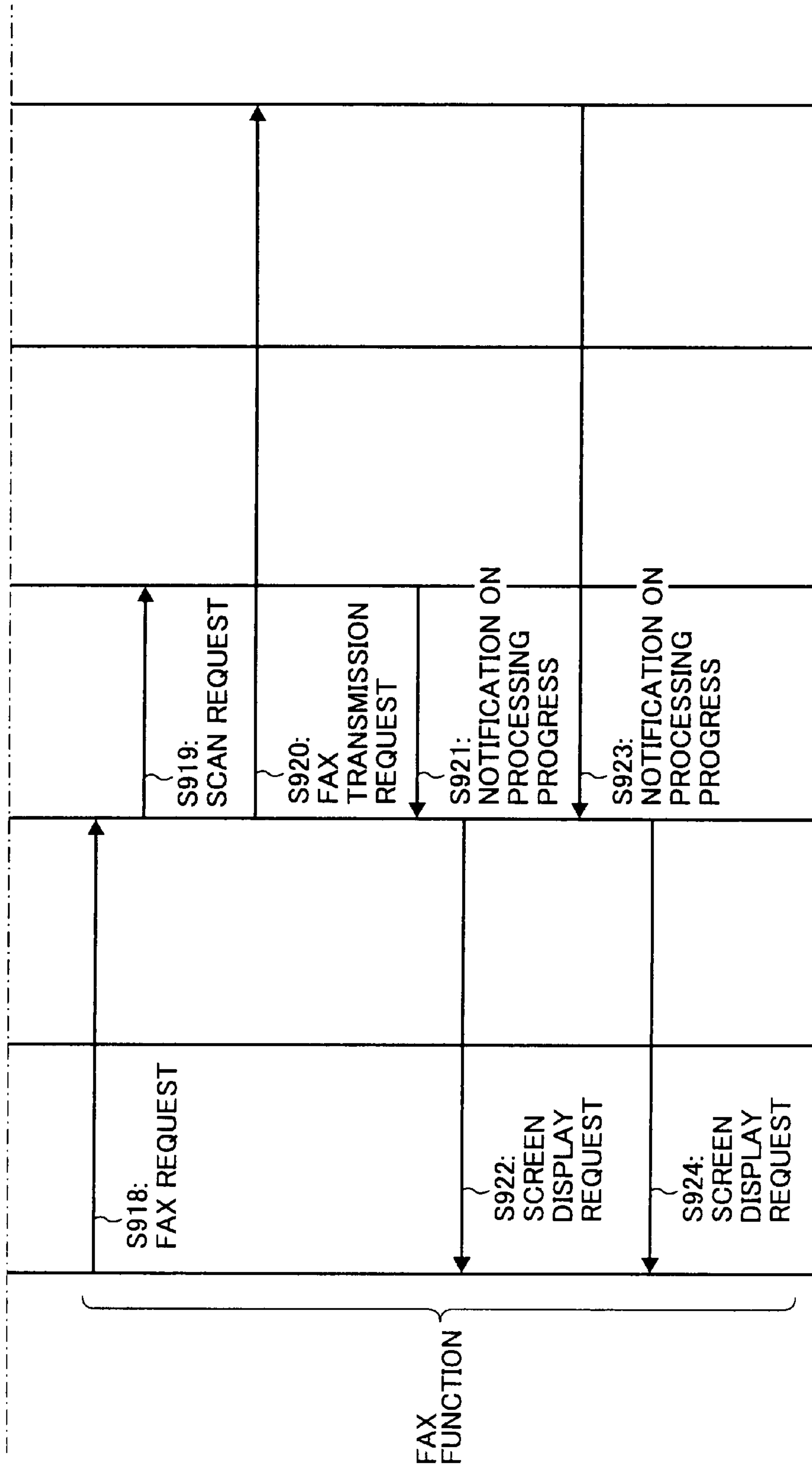


FIG. 10

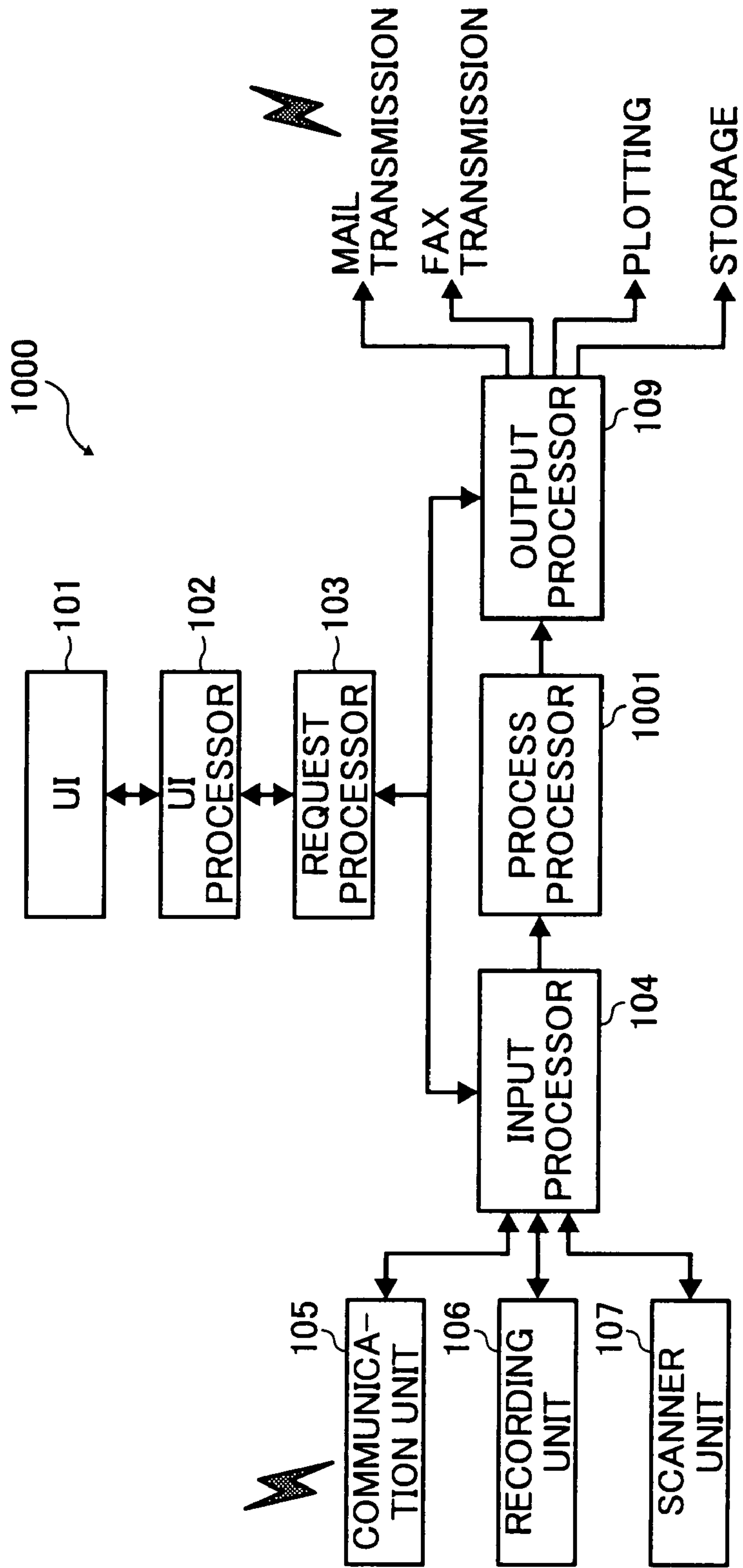


FIG. 11

1100

1101 REQUEST	1102 INPUT MODE	1103 PROCESS MODE	1104 OUTPUT MODE
COPY FOR MATERIAL	SCANNING	LAYOUT	PLOTting
RIGHT COPY	SCANNING	REDUCTION	PLOTting
TEST PRINTING	PC DOCUMENT	SAMPLE STAMP PRINTING	PLOTting



FIG. 12

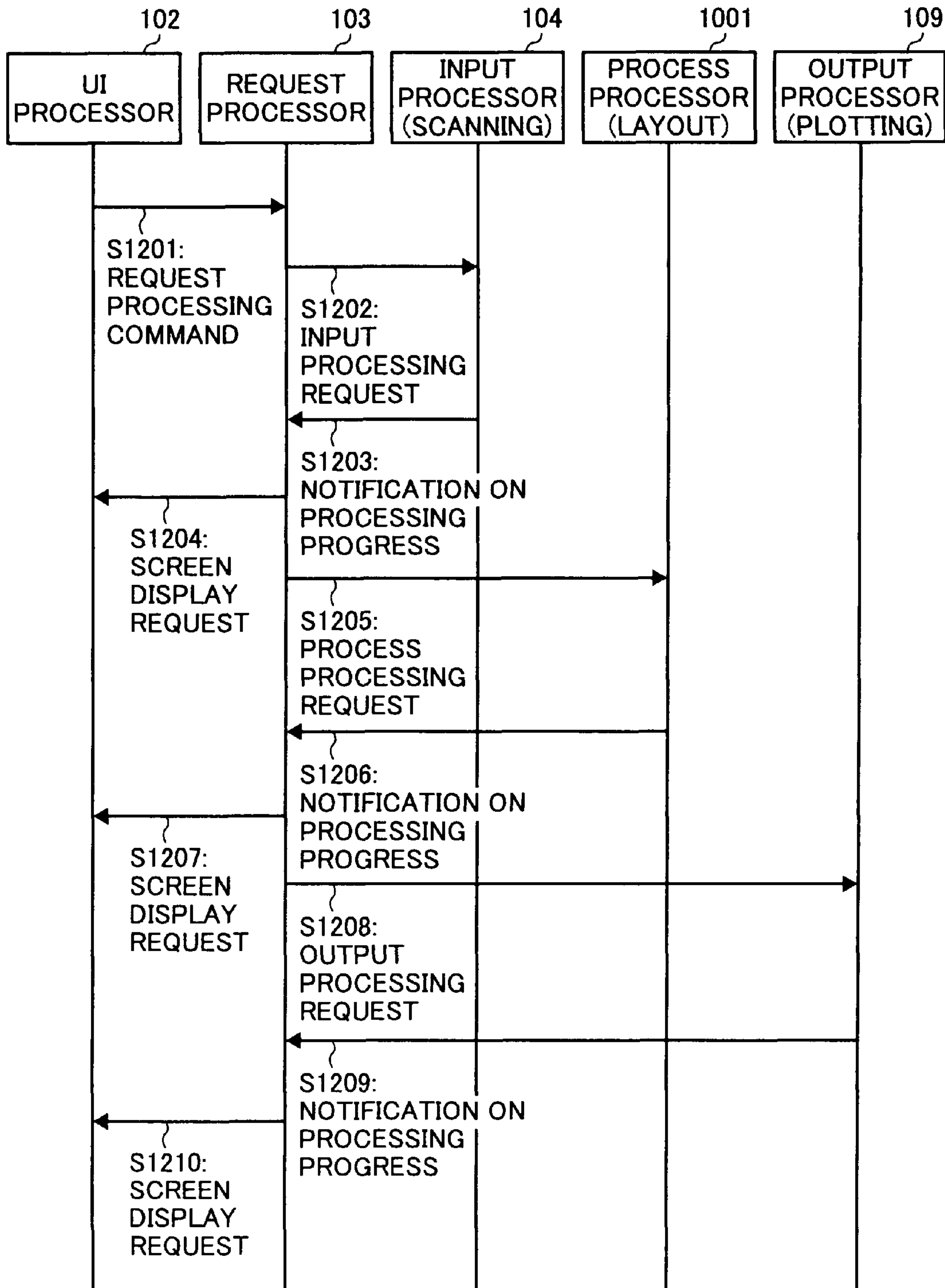


FIG. 13

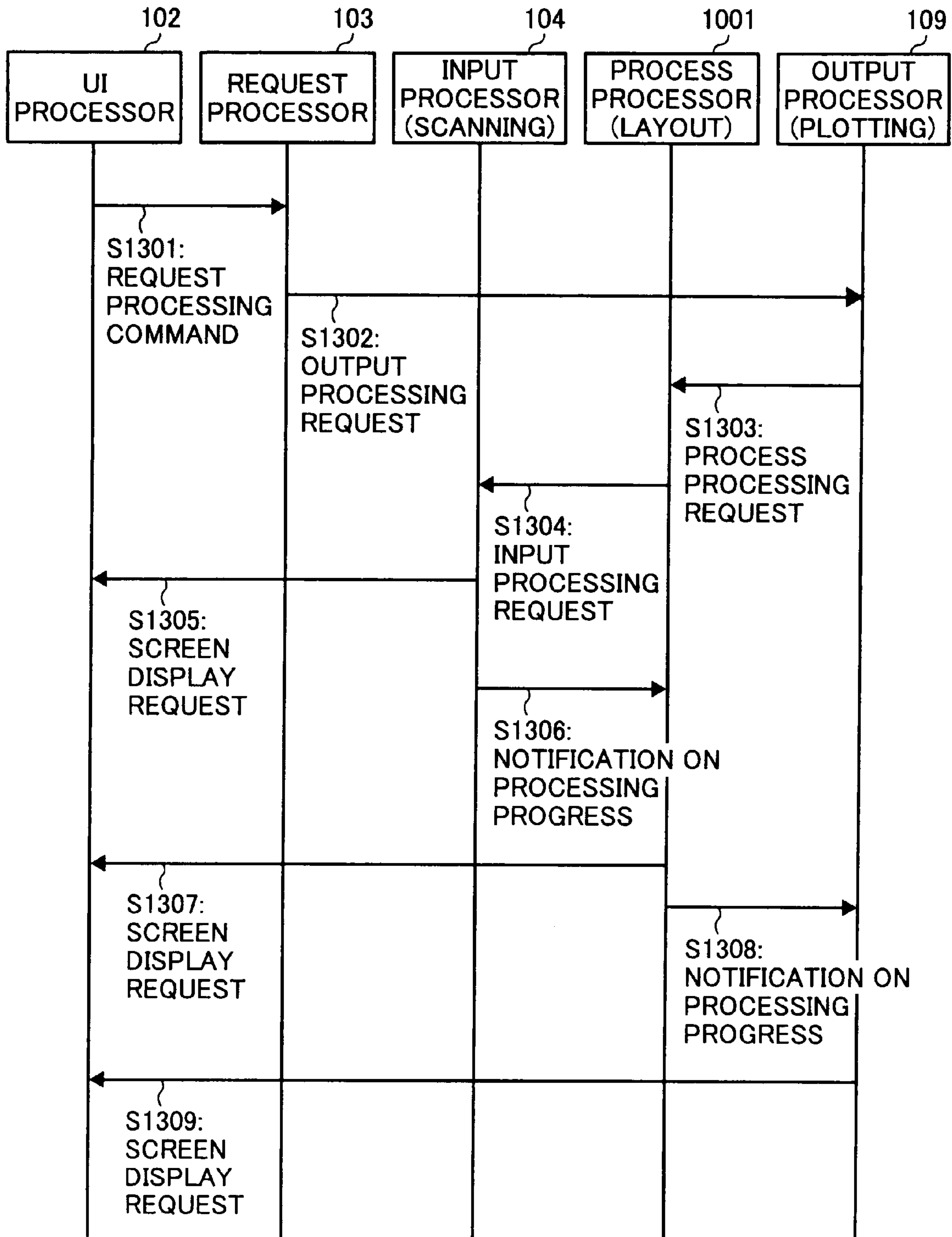
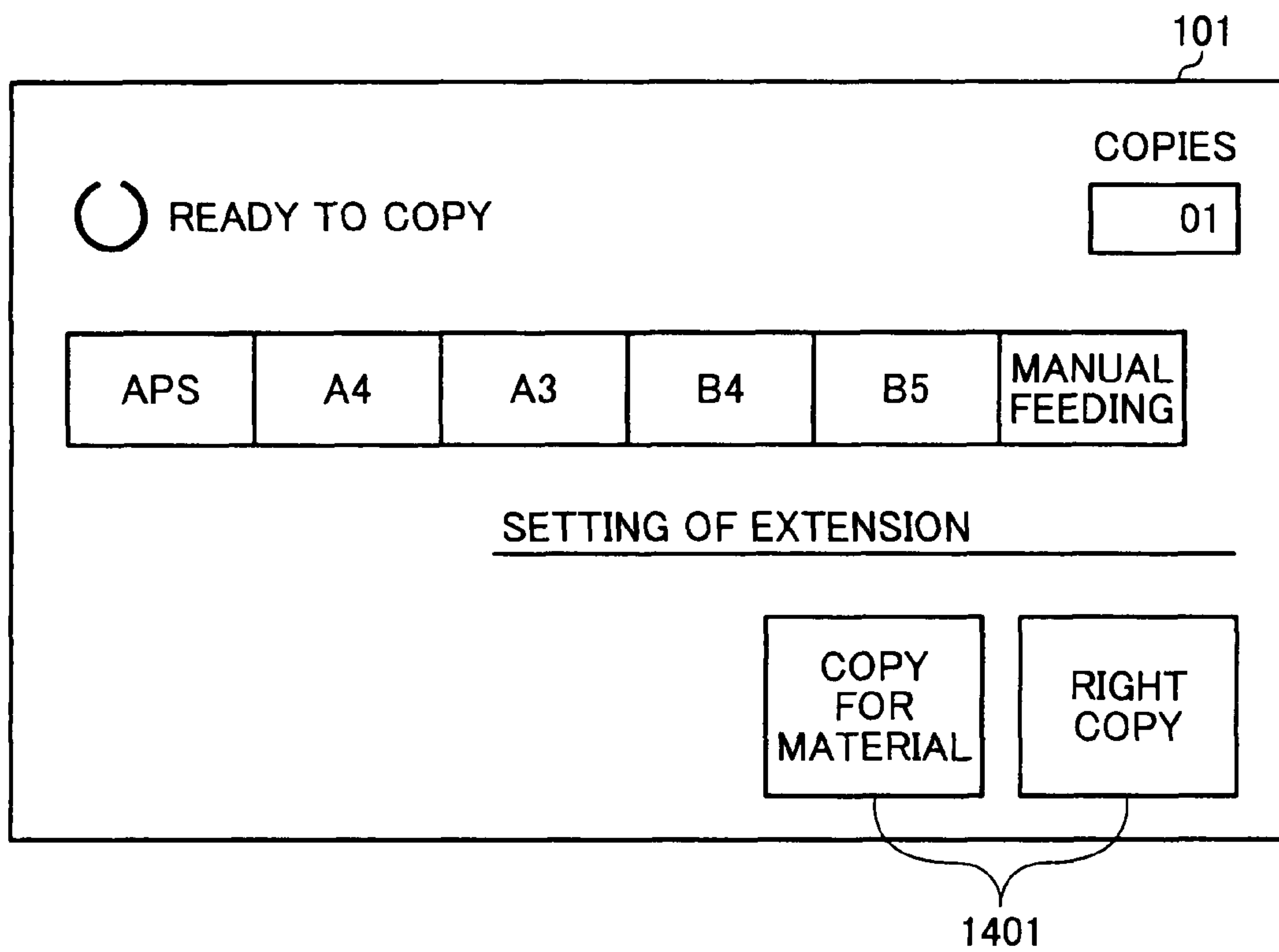


FIG. 14





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**IMAGE PROCESSING APPARATUS, IMAGE  
PROCESSING METHOD, AND COMPUTER  
PROGRAM PRODUCT CONFIGURED FOR  
OUTPUT THROUGH PLURAL OUTPUT  
UNITS AT CORRESPONDING OUTPUT  
TIMING**

CROSS-REFERENCE TO RELATED  
APPLICATIONS

The present document incorporates by reference the entire contents of Japanese priority documents, 2006-027559 filed in Japan on Feb. 3, 2006 and 2006-329990 filed in Japan on Dec. 6, 2006.

BACKGROUND OF THE INVENTION

1. Technical Field

This disclosure generally relates to a technology for image processing.

2. Description of the Related Art

In digital multifunction products, a plurality of image processing functions such as a copying function, a facsimile (fax) function, a printing function, and a mail transmission function is included. A technology related to the digital multifunction product having these image processing functions is disclosed in Japanese Patent Application Laid-Open No. 2002-44311. In the technology, the digital multifunction product performs a plurality of image processes using a single unit by requesting each of the image processes to each of units that perform individual functions. FIG. 9 is a sequence diagram of a processing of a conventional combined operation. A method of performing image processing on the same image information using the copying function and the fax function is explained with reference to FIG. 9.

In FIG. 9, a user interface (UI) (not shown) is operated, and a UI processor 901 creates a copy request and a fax request. The UI processor 901 sets either one of the created requests as a unit that serves as a function of image processing corresponding to the request. In the case of FIG. 9, the UI processor 901 sends the copy request to a copying unit 902 (step S911). Upon receiving the copy request, the copying unit 902 sends a scan request to a scanner controller 904 that is an input unit of image information (step S912), and sends a plot request to a plotter controller 905 that is an output unit of image information (step S913). More specifically, the copying unit 902 performs the image processing immediately after an input of the image information is started by scanning, and the plotter controller 905 outputs the image information by plotting.

The scanner controller 904 sends a notification on processing progress to the copying unit 902 as needed (step S914). In FIG. 9, the scanner controller 904 sends the notification thereto every time one-page scanning is finished. When accepting the notification, the copying unit 902 sends a screen display request to the UI processor 901 (step S915). The UI processor 901 controls a UI and notifies a user of the number of pages having been scanned. Similarly, the plotter controller 905 sends a notification on processing progress to the copying unit 902 as needed (step S916). In FIG. 9, the plotter controller 905 sends the notification to the copying unit 902 every time one-page plotting is finished. Upon receiving the notification, the copying unit 902 sends a screen display request to the UI processor 901 (step S917). The UI processor 901 controls the UI and notifies the user of the number of pages having been plotted.

When a series of operations of the copying function is completed, the UI processor 901 sends a fax request to a fax

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unit 903 (step S918). The fax unit 903 receives the fax request and again sends the scan request to the scanner controller 904 (step S919). When the scanning is completed, the fax unit 903 sends a fax transmission request to a fax controller 906 (step S920). More specifically, the fax unit 903 performs the image processing immediately after an input of the image information is completed by scanning, and the fax controller 906 outputs the image information by fax transmission.

The scanner controller 904 sends a notification on processing progress to the fax unit 903 as needed (step S921). In FIG. 9, the scanner controller 904 sends the notification to the fax unit 903 every time one-page scanning is finished. The fax unit 903 receives the notification and sends a screen display request to the UI processor 901 (step S922). The UI processor 901 controls the UI and notifies the user of the number of pages having been scanned. The fax unit 903 determines that the input is completed by the notification indicating the input completion received from the scanner controller 904. Similarly, the fax controller 906 sends a notification on processing progress to the fax unit 903 as needed (step S923). In FIG. 9, the fax controller 906 sends the notification to the fax unit 903 every time one-page fax transmission is finished. The fax unit 903 receives the notification and sends a screen display request to the UI processor 901 (step S924). The UI processor 901 controls the UI and notifies the user of the number of pages having been transmitted by fax.

In the described conventional technology, however, the digital multifunction product as a single unit cannot efficiently perform a plurality of image processes because each of image processing requests are sent one by one to each corresponding unit that serves each corresponding image processing function. For example, as shown in FIG. 9, the copying unit 902 sends the scan request to the scanner controller 904 according to the copy request at step S912 while the fax unit 903 sends the same scan request to the scanner controller 904 according to the fax request at step S919. In this manner, even if requested modes to input the image information are the same, the units sending the request are different and the same processing has to be performed twice. Therefore, it is difficult for the digital multifunction product to reduce a time required for the image processes compared with that when separated devices each having a single function are collectively used.

BRIEF SUMMARY

According to an aspect of this disclosure, an image processing apparatus includes a plurality of input units each configured to perform input processing including receiving input of image information; a receiving unit that receives a plurality of operation requests that indicate how the image information is to be processed; a plurality of output units configured to perform output processing including outputting processed image information; a request interpretation unit that interprets the operation requests and decides a combination of at least one first input unit among the input units and at least one first output unit among the input units corresponding to the operation requests; and an input/output-processing request unit that requests the first input unit to receive input of the image information, and requests the first output unit to output the processed image information.

According to another aspect, a method of processing image information on an image processing apparatus including a plurality of input units each configured to perform input processing including receiving input of the image information and a plurality of output units configured to perform output processing including outputting processed image informa-



tion includes receiving a plurality of operation requests that indicate how the input image information received through the input unit is to be processed; interpreting the operation requests and deciding a combination of at least one first input unit among the input units and at least one first output unit among the input units corresponding to the operation requests; and causing the first input unit to receive input of the image information and the first output unit to output the processed image information.

According to another aspect, there is provided a computer-readable recording medium having recorded thereon a computer program that causes a computer to perform the above method.

The above and other aspects, features, advantages and technical and industrial significance will be better understood by reading the following detailed description of presently preferred embodiments, when considered in connection with the accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of an image processing apparatus according to a first embodiment of the present invention;

FIG. 2 is a block diagram of a request processor shown in FIG. 1;

FIG. 3 is an example of contents of a request-decomposition rule book shown in FIG. 2;

FIG. 4 is an example of contents of a transmission-timing rule book shown in FIG. 2;

FIG. 5 is a block diagram of an example of a hardware configuration of the image processing apparatus shown in FIG. 1;

FIG. 6 is a sequence diagram of a processing for a single operation performed by the image processing apparatus shown in FIG. 1;

FIG. 7 is a sequence diagram of a processing performed by the request processor shown in FIG. 1;

FIG. 8 is a sequence diagram of a processing for a combined operation performed by the image processing apparatus shown in FIG. 1;

FIG. 9 is a sequence diagram of a processing for a combined operation based on the conventional technology;

FIG. 10 is a block diagram of an image processing apparatus according to a second embodiment of the present invention;

FIG. 11 is an example of contents of a request-decomposition rule book according to the second embodiment;

FIG. 12 is a sequence diagram of a processing performed by the image processing apparatus shown in FIG. 11;

FIG. 13 is a sequence diagram of another processing performed by the image processing apparatus shown in FIG. 11; and

FIG. 14 is a schematic of an example of a user interface (UI) displaying request-corresponding keys according to the second embodiment.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Exemplary embodiments of the present invention are explained in detail below with reference to the accompanying drawings.

FIG. 1 is a block diagram of an image processing apparatus 100 according to a first embodiment of the present invention. The image processing apparatus 100 includes a user interface

(UI) 101, a UI processor 102, a request processor 103, an input processor 104, an image processor 108, and an output processor 109.

The UI 101 includes a display screen for reporting information related to image processing to the user. The information related to image processing includes functional information such as mail transmission, fax transmission, plotting, and storage, and information for processing progress such as print copies or a destination in each function. The UI 101 also includes an input unit that receives information related to the image processing from the user. More specifically, the input unit is a touch panel laminated on the display screen.

The UI processor 102 controls the UI 101. The UI processor 102 receives the information related to the image processing input through the UI 101 to create a request processing command. The request processing command is a command to request processes to the functions. Upon receiving a screen display request, the UI processor 102 controls the UI 101 to display information for the processing progress on the display screen.

The request processor 103 receives the request processing command, interprets the request, and decomposes the request into an input processing request and an output processing request. The request processor 103 sends the input processing request and the output processing request to the input processor 104 and the output processor 109 respectively, which are explained later, at respective timings. More specifically, when the request processing command is copying, the input processing request is scanning, and the output processing request is plotting. The timing for the requests is a timing of sending the output processing request immediately after the input processing request is sent. Upon receiving notifications on processing progresses from the input processor 104 and the output processor 109, the request processor 103 sends a screen display request to the UI processor 102.

The input processor 104 receives the input processing request from the request processor 103. The input processor 104 controls an input in response to reception of the input processing request, based on the received input processing request. The input includes inputting information received by a communication unit 105 through a server, information stored in a recording unit 106, and image information read by a scanner unit 107. The input processor 104 starts inputting information and sends a notification on processing progress to the request processor 103 as needed.

The image processor 108 subjects the image information input by the input processor 104 to image processing. The image processor 108 sends the processed data to the output processor 109. The output processor 109 receives the output processing request from the request processor 103. The output processor 109 controls the data processed by the image processor 108 so as to be output in response to reception of the output processing request, based on the received output processing request. The output includes mail transmission, fax transmission, plotting, and storage. The output processor 109 starts the output and sends a notification on processing progress to the request processor 103 as needed.

FIG. 2 is a block diagram of the request processor 103. The request processor 103 includes a storage unit 201, a request interpretation unit 210, and an input/output (I/O)-request transmission unit 211.

The storage unit 201 stores therein information required to interpret the request processing command. The required information includes a request-decomposition rule book 202 and a transmission-timing rule book 203. The request-decomposition rule book 202 stores therein information used to determine what each request is and also used to decompose



the request into a combination of an input mode and an output mode required to execute the request (see FIG. 3). The transmission-timing rule book 203 stores therein information about timing of transmitting the request decomposed into the combination of the input mode and the output mode, to the input processor 104 and the output processor 109, respectively (see FIG. 4). The storage unit 201 can be removable i.e. replaceable, or can be able to rewrite information.

The request interpretation unit 210 interprets the request processing command received from the UI processor 102 based on the request-decomposition rule book 202, and decomposes the requests into combinations of the input mode and the output mode. More specifically, when the request processing command is copying, the request interpretation unit 210 interprets the request as copying, and decomposes the request into a combination of scanning as the input and plotting as the output. This allows the request interpretation unit 210 to easily interpret processing contents even if a new image process is added. Thus, the user can easily respond to model change of the main body or to its customization.

The I/O-request transmission unit 211 transmits the input processing request obtained as the decomposed request to the input processor 104 and the output processing request obtained as the decomposed request to the output processor 109 at a timing according to the transmission-timing rule book 203. More specifically, when the request indicates copying, the I/O-request transmission unit 211 transmits the output processing request to the output processor 109 immediately after the input processing request is transmitted to the input processor 104. Thus, even if a new image process is added, the I/O-request transmission unit 211 can easily set the image process if the input mode and the output mode are not added.

FIG. 3 is an example of contents of the request-decomposition rule book 202. The request-decomposition rule book 202 stores therein information about decomposition rules in a listed manner. The decomposition rule is a rule for a combination of an input mode 302 and an output mode 303 required to execute a request 301. For example, when the request 301 is "copying", the combination of the input mode 302 and the output mode 303 is a combination of "scanning" as the input mode 302 and "plotting" as the output mode 303.

The request-decomposition rule book 202 can register therein a request to be frequently used. For example, if the request 301 indicating "copy and fax" is registered, the combination of the input mode 302 and the output mode 303 corresponding to the request 301 is a combination of "scanning" as the input mode 302 and "plotting" and "fax transmission" as the output mode 303.

The request-decomposition rule book 202 can be replaceable. More specifically, if a model-dependent decomposition rule needs to be set, for example, if a new request is added in a new model, the request-decomposition rule book 202 for a new model including a decomposition rule for a new request is created, and the request-decomposition rule book 202 is replaced with the newly created request-decomposition rule book 202. Furthermore, when it is necessary to set a user-dependent decomposition rule, for example, if it is necessary to switch an available image processing operation depending on a user, the request-decomposition rule book 202 for each user is created, and the request-decomposition rule book 202 is replaced with the newly created request-decomposition rule book 202 depending on authorization for each user. This enables the request processor 103 to reject a request processing command unauthorized for the user, by not containing a request unauthorized for the user in the request-decomposition rule book 202. Furthermore, because a storage medium

with the rule stored therein is removable, there is no need to reboot the system upon change of the rule.

FIG. 4 is an example of contents of the transmission-timing rule book 203. The transmission-timing rule book 203 contains information about transmission timing rules in a listed manner. The transmission timing rule is such that a transmission timing 403 of transmitting an input processing request and an output processing request is specified based on a combination of an input mode 401 and an output mode 402. The transmission timing 403 corresponds to the combination of the input mode 401 and the output mode 402 irrespective of the request 301 of FIG. 3. In FIG. 4, the combination of the input mode 401 and the output mode 402 indicates a combination of "scanning" as the input mode 401 and "plotting" as the output mode 402. Accordingly, the transmission timing 403 is "an output processing request is sent immediately after an input processing request is sent".

The transmission-timing rule book 203 can be replaceable. More specifically, when a model-dependent transmission timing rule needs to be set, for example, if a new request is added in a new model and a new transmission timing rule is need to be set, the transmission-timing rule book 203 for a new model including the new transmission timing rule is created, and the transmission-timing rule book 203 is replaced with the newly created transmission-timing rule book 203. Furthermore, if there is a transmission timing which cannot be implemented depending on a model, for example, if the function is restricted by a hardware configuration depending on a model, the transmission-timing rule book 203 corresponding to the model is created, and the transmission-timing rule book 203 is replaced with the newly created transmission-timing rule book 203 for each model. This enables the user to change the transmission timing depending on the model, to implement optimal performance for each model. Furthermore, because the storage medium with the rule stored therein is removable, there is no need to reboot the system upon change of the rule.

FIG. 5 is a block diagram of a hardware configuration of the image processing apparatus 100. The image processing apparatus 100 includes a Central Processing Unit (CPU) 501, a Read Only Memory (ROM) 502, a Random Access Memory (RAM) 503, a Hard Disk Drive (HDD) 504, a Hard Disk (HD) 505, a Compact Disk/Digital Versatile Disk (CD/DVD) drive 506, a CD/DVD 507, a display 508, an input interface (I/F) 509, a communication I/F 510, a plotter 511, and a scanner 512. The components 501 to 512 communicate each other through a bus 500.

The CPU 501 controls the entirety of the image processing apparatus 100. The ROM 502 stores therein various control programs. The RAM 503 is used as a work area of the CPU 501. The HDD 504 controls read/write of data from/to the HD 505 according to a control instruction of the CPU 501. The HD 505 stores therein the data written by the control of the HDD 504. The CD/DVD drive 506 controls read/write of data from/to the CD/DVD 507 according to a control instruction of the CPU 501.

The CD/DVD 507 stores therein the data written by the control of the CD/DVD drive 506 and is removable. The removable recording medium can be a Magneto-Optical (MO) Disc, a Flexible Disk (FD), and a memory card, in addition to the CD/DVD 507. The display 508 displays data such as a document, image, and function information. The display 508 is, for example, a liquid crystal display.

The input I/F 509 is a remote controller, a keyboard, or a touch panel that includes a plurality of keys to input and set characters, numerical values, and various instructions. The input I/F 509 can be implemented by any one of the remote



controller, the keyboard, and the touch panel, but can also be implemented by a combination of these devices. The communication I/F **510** is connected to a telephone line, the Internet, and a Local Area Network (LAN) (not shown) through a communication line. The plotter **511** plots image information which has been subjected to image processing. The scanner **512** optically reads image information.

The function of the UI **101** is implemented by the display **508** and the input I/F **509**. Similarly, the functions of the UI processor **102**, the request processor **103**, the input processor **104**, the image processor **108**, and the output processor **109** are implemented by the CPU **501**, the ROM **502**, and the RAM **503**. The functions of the communication unit **105**, the mail transmission, and the fax transmission are implemented by the communication I/F **510**. The functions of the recording unit **106**, the storage unit **201**, and the storage are implemented by the HD **505** and the CD/DVD **507**. The function of the scanner unit **107** is implemented by the scanner **512**. The plotting is implemented by the plotter **511**.

FIG. **6** is a sequence diagram of a processing for a single operation performed by the image processing apparatus **100**. As an example of the single operation, copying is explained. The UI **101** is operated so that the UI processor **102** sends a request processing command created by the UI processor **102** to the request processor **103** (step **S601**). In FIG. **6**, the UI processor **102** sends a copy request received from the user to the request processor **103**.

The request processor **103** interprets the request based on the request processing command and decomposes the request into an input processing request and an output processing request. More specifically, the request processor **103** interprets the request as copying, and decomposes the request processing command into the input processing request (scanning) and the output processing request (plotting). The request processor **103** sends the input processing request to the input processor **104** that controls scanning, at the timing specified in the transmission-timing rule book **203** (step **S602**). Similarly, the request processor **103** sends the output processing request to the output processor **109** that controls plotting, at the timing specified in the transmission-timing rule book **203** (step **S603**).

The input processor **104** and the output processor **109** start respective processes upon reception of the input processing request and the output processing request. In FIG. **6**, the request processor **103** sends the input processing request to the input processor **104**. In other words, the input processor **104** controls the scanner unit **107** so as to start scanning image information. In addition, the request processor **103** sends the output processing request to the output processor **109** immediately after sending the input processing request to the input processor **104**. In other words, the output processor **109** starts plotting the image information processed by the image processor **108** immediately after the scanning is started.

The input processor **104** sends a notification on processing progress to the request processor **103** as needed (step **S604**). In FIG. **6**, the input processor **104** sends the notification to the request processor **103** every time one-page scanning is finished. The request processor **103** receives the notification and sends a screen display request to the UI processor **102** (step **S605**). The UI processor **102** controls the UI **101** and notifies the user of the number of pages whose scanning is finished. Similarly, the output processor **109** sends a notification on processing progress to the request processor **103** as needed (step **S606**). In FIG. **6**, the output processor **109** sends the notification to the request processor **103** every time one-page plotting is finished. The request processor **103** receives the notification and sends a screen display request to the UI

processor **102** (step **S607**). The UI processor **102** controls the UI **101** and notifies the user of the number of pages whose plotting is finished.

The request processing command is explained using the copying as an example in FIG. **6**, but the request processing command is not limited by the copying. For example, the request processing command can be fax transmission, mail transmission, and storage.

FIG. **7** is a sequence diagram of a processing performed by the request processor **103**. Because FIG. **7** includes the same processings explained in the single operation processing shown in FIG. **6**, the overlapping explanation is omitted. At step **S601** of FIG. **6**, the UI processor **102** creates a request processing command and sends it to the request processor **103**.

When the request processor **103** receives the request processing command, the request interpretation unit **210** sends a reference request for referring to the decomposition rule to the request-decomposition rule book **202** (step **S701**). The request-decomposition rule book **202** receives the reference request and presents the decomposition rule to the request interpretation unit **210** (step **S702**). The request interpretation unit **210** interprets the request according to the decomposition rule, and decomposes the request processing command into the input processing request and the output processing request.

The request interpretation unit **210** sends the input processing request and the output processing request to the I/O-request transmission unit **211** (step **S703**). The I/O-request transmission unit **211** receives the requests and sends a reference request for referring to the transmission timing rule to the transmission-timing rule book **203** (step **S704**). The transmission-timing rule book **203** receives the reference request and presents the transmission timing rule to the I/O-request transmission unit **211** (step **S705**). The I/O-request transmission unit **211** sends the input processing request and the output processing request to the input processor **104** and the output processor **109** respectively, at the respective timing specified in the transmission-timing rule book **203** (steps **S602** and **S603**).

FIG. **8** is a sequence diagram of a processing for a combined operation performed by the image processing apparatus **100**. The combined operation is explained using the copying and fax transmission as an example. In FIG. **8**, the UI **101** is operated so that the UI processor **102** sends a request processing command created by the UI processor **102** to the request processor **103** (step **S801**). When two or more requests are concurrently requested, the request processing command is counted as one. In FIG. **8**, the UI processor **102** receives the request for the copying and fax transmission from the user.

The request processor **103** interprets the request, and decomposes the request processing command into an input processing request and an output processing request. In this case, because the request is interpreted as copying and fax transmission, both the input processing requests for the copying and fax transmission indicate scanning, while the output processing requests indicate plotting and fax transmission. The request processor **103** sends the input processing request to the input processor **104** that controls scanning, at the timing specified in the transmission-timing rule book **203** (step **S802**). Similarly, the request processor **103** sends the output processing request to an output processor **109a** that controls plotting and also sends the output processing request to an output processor **109b** that controls fax transmission, at the respective timing specified in the transmission-timing rule book **203** (steps **S803** and **S805**).



The input processor **104** and the output processor **109** start the respective processes upon reception of the input processing request and the output processing, respectively. In FIG. **8**, the request processor **103** sends the input processing request to the input processor **104**. In other words, the input processor **104** controls the scanner unit **107** so as to start scanning image information. In addition, the request processor **103** sends the output processing request to the output processor **109a** immediately after sending the input processing request to the input processor **104**. In other words, the output processor **109a** starts plotting the image information processed by the image processor **108** immediately after the scanning is started.

The input processor **104** sends a notification on processing progress to the request processor **103** as needed (step **S804**). In FIG. **8**, the input processor **104** sends the notification to the request processor **103** every time one-page scanning is finished. When the notification by the input processor **104** indicates that all the processes are finished, the request processor **103** sends the output processing request to the output processor **109b** (step **S805**). In other words, the output processor **109b** starts fax transmission after the scanning is completed. At step **S804**, determination as to whether the notification indicates that all the processes are complete is performed in such a manner that when there is no input for a predetermined time, this is determined as completion of all the processes.

The request processor **103** receives the notification from the input processor **104** and sends a screen display request to the UI processor **102** (step **S806**). The UI processor **102** controls the UI **101** and notifies the user of the number of pages whose scanning is finished. Similarly, the output processor **109a** sends a notification on processing progress to the request processor **103** as needed (step **S807**). In FIG. **8**, the output processor **109a** sends the notification to the request processor **103** every time one-page plotting is finished. The request processor **103** receives the notification and sends a screen display request to the UI processor **102** (step **S808**). The UI processor **102** controls the UI **101** and notifies the user of the number of pages whose plotting is finished. Furthermore, the output processor **109b** sends a notification on processing progress to the request processor **103** as needed (step **S809**). In FIG. **8**, the output processor **109b** sends the notification to the request processor **103** every time one-page fax transmission is finished. The request processor **103** receives the notification and sends a screen display request to the UI processor **102** (step **S810**). The UI processor **102** controls the UI **101** and notifies the user of the number of pages whose fax transmission is finished.

Referring to FIG. **8**, the request processing command including copying and fax transmission is explained as an example, but it is not limited thereto. For example, the request processing command can also include copying and mail transmission, copying and storage, fax transmission and mail transmission, fax transmission and storage, and mail transmission and storage. As for the request processing command, three or more requests can be concurrently sent. More specifically, as the request processing command, for example, copying-fax transmission and mail transmission-storage are concurrently requested. In both of the cases, when there is the same mode in input modes and output modes, the input processing and the output processing can be respectively performed only once. Therefore, the user can efficiently perform a plurality of image processes. Furthermore, even if the image processes required by the user are complicated, the request is interpreted by the combination of the input mode and the output mode, and this enables the user to extend a work flow.

As explained above, in the image processing apparatus, an image processing method, an image processing program, and

a recording medium, the image processes for the input image information are interpreted by the combination of the input mode and the output mode. Therefore, if the same mode is included in the input modes and the output modes when the image processes are to be performed, the process is performed only once for the image processes. Thus, it is possible to reduce the time required for the image processes.

FIG. **10** is a block diagram of an image processing apparatus **1000** according to a second embodiment of the present invention. In the second embodiment, the same reference numerals are assigned to the components corresponding to those of the first embodiment, and explanation thereof is omitted. The user performs a predetermined operation upon input of image information, and the digital multifunction product having the copying function can thereby perform processing according to the predetermined operation on the input image information, and output the image information. The second embodiment is an example of adding to the request-decomposition rule book **202** a process mode with which predetermined processing is further performed on the input image information.

As shown in FIG. **10**, the image processing apparatus **1000** includes the UI **101**, the UI processor **102**, the request processor **103**, the input processor **104**, a process processor **1001**, and the output processor **109**.

The process processor **1001** uses the image information input by the input processor **104** to perform processing on the image information based on an operation of the user and based on a request-decomposition rule book **1100** explained later. The processing indicates process processing performed on the input image information according to a predetermined program. The predetermined program includes a program causing the process processor to implement the process of changing magnification (hereinafter, "scaling") of the input image information, a program causing it to rotate the input image information according to output image information, a program causing it to perform stamp printing on the input image information and to output the information, and a program causing it to perform layout.

The layout is to match a layout such as the size of a font and the dimensions of a graphic with its finish appearance. More specifically, if the request is "copy for material", then "layout" in the process mode is implemented by performing processing in such a manner that input two-page image information is laid out to form one-page image information. The process processor **1001** sends the processed data to the output processor **109**. The process processor **1001** can also concurrently perform a plurality of processes such as layout and scaling.

FIG. **11** is an example of contents of the request-decomposition rule book **1100**. The request-decomposition rule book **1100** stores therein information about decomposition rules in a listed manner. The decomposition rules are combination rules obtained by further adding the process mode to the decomposition rules explained in the first embodiment. More specifically, the decomposition rule is a rule combined with an input mode **1102**, a process mode **1103**, and an output mode **1104**, which are required to execute a request **1101**. The input mode **1102** is information for identifying a unit used to input image information. The process mode **1103** is information for identifying a program used to perform processing on the input image information. The output mode **1104** is information for identifying a unit used to output the input image information.

The combination rule is information in which pieces of information for identifying the particular input mode **1102**, the particular process mode **1103**, and the particular output



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mode 1104 are associated with one another for each piece of identification information to identify the request 1101. As shown in FIG. 11, if the request 1101 is “copy for material”, then the combination rule for the input mode 1102, the process mode 1103, and the output mode 1104 is information such that “scanning” as the input mode 1102, “layout” as the process mode 1103, and “plotting” as the output mode 1104 are associated with one another.

FIG. 12 is a sequence diagram of a processing performed by the image processing apparatus 1000. An example that an operation of specifying the request 1101 to identify the “copy for material” is input is explained below. The UI 101 is operated so that the UI processor 102 sends a request processing command created by the UI processor 102 to the request processor 103 (step S1201). More specifically, when the UI 101 is operated, the UI processor 102 creates the request processing command and makes the request by outputting the created request processing command to the request processor 103.

The request processor 103 interprets the request based on the request processing command, and decomposes the request into an input processing request, a process processing request, and an output processing request. The interpretation is to identify a rule to combine the input mode 1102, the process mode 1103, and the output mode 1104, which are required to execute the request. The request processor 103 interprets the request as the copy for material, and decomposes the request processing command into the input processing request (scanning), the process processing request (layout), and the output processing request (plotting).

The request processor 103 sends the input processing request to the input processor 104 that controls scanning (step S1202). More specifically, the request processor 103 makes the request by outputting the input processing request to the input processor 104. The input processor 104 starts the processing upon reception of the input processing request. In other words, the input processor 104 controls the scanner unit 107 and starts scanning the image information.

The input processor 104 sends a notification on processing progress to the request processor 103 as needed (step S1203). In FIG. 12, the input processor 104 sends the notification to the request processor 103 every time one-page scanning is finished. The request processor 103 receives the notification and sends a screen display request to the UI processor 102 (step S1204). More specifically, the request processor 103 makes the request by outputting the screen display request to the UI processor 102. The UI processor 102 controls the UI 101 and notifies the user of the number of pages whose scanning is finished.

Upon receiving the notification from the input processor 104, the request processor 103 immediately sends the process processing request to the process processor 1001 (step S1205). More specifically, the request processor 103 makes the request by outputting the process processing request to the process processor 1001. The process processor 1001 starts the processing upon reception of the process processing request. In other words, the process processor 1001 performs, in this case, layout on the image information scanned by the scanner unit 107 according to the request-decomposition rule book 1100.

The process processor 1001 sends a notification on processing progress to the request processor 103 as needed (step S1206). In FIG. 12, the process processor 1001 sends the notification to the request processor 103 every time one-page processing is finished. The request processor 103 receives the notification and sends a screen display request to the UI processor 102 (step S1207). More specifically, the process

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processor 1001 makes the request by outputting the screen display request to the UI processor 102. The UI processor 102 controls the UI 101 and notifies the user of information such as “completion of image processing”.

Upon receiving the notification from the process processor 1001, the request processor 103 immediately sends the output processing request to the output processor 109 that controls plotting (step S1208). More specifically, the request processor 103 makes the request by outputting the output processing request to the output processor 109. The output processor 109 starts the processing upon reception of the output processing request. In other words, the output processor 109 starts plotting the image information processed by the process processor 1001 immediately after scanning is started.

The output processor 109 sends a notification on processing progress to the request processor 103 as needed (step S1209). In FIG. 12, the output processor 109 sends the notification to the request processor 103 every time one-page plotting is finished. The request processor 103 receives the notification and sends a screen display request to the UI processor 102 (step S1210). More specifically, the request processor 103 makes the request by outputting the screen display request to the UI processor 102. The UI processor 102 controls the UI 101 and notifies the user of the number of pages whose plotting is finished.

Furthermore, even if the request processor 103 collectively sends decomposed request processing commands to the output processor 109, the process processing request is automatically sent from the output processor 109 to the process processor 1001, and the input processing request is also automatically sent from the process processor 1001 to the input processor 104, that is, the same processing as explained above is performed. FIG. 13 is a sequence diagram of another processing performed by the image processing apparatus 1000.

Similarly to FIG. 12, in FIG. 13, the operation of specifying the request 1101 to identify “copy for material” is explained below as an example. The UI 101 is operated so that the UI processor 102 sends a request processing command created by the UI processor 102 to the request processor 103 (step S1301). In FIG. 13, the UI processor 102 sends a request for copy for material received from the user to the request processor 103. More specifically, when the UI 101 is operated, the UI processor 102 creates the request processing command and makes the request by outputting the created request processing command to the request processor 103.

The request processor 103 interprets the request based on the request processing command, and decomposes the request into an input processing request, a process processing request, and an output processing request. In this case, the request processor 103 interprets the request as the copy for material, and decomposes the request processing command into the input processing request (scanning), the process processing request (layout), and the output processing request (plotting). Next, the request processor 103 collectively transmits the input processing request, the process processing request, and the output processing request to the output processor 109 (step S1302).

The output processor 109 stores therein the output processing request from among the input processing request, the process processing request, and the output processing request transmitted from the request processor 103, and sends the input processing request and the process processing request to the process processor 1001 (step S1303). The process processor 1001 stores therein the process processing request from among the input processing request and the process processing request sent from the output processor 109, and



sends the input processing request to the input processor **104** (step **S1304**). More specifically, the process processor **1001** makes the request by outputting the input processing request to the input processor **104**.

When the input processing request is sent from the process processor **1001**, the input processor **104** immediately controls the scanner unit **107** to start scanning the image information. The input processor **104** finishes the input processing, and thereafter, sends a screen display request to the UI processor **102** every time one-page scanning is finished (step **S1305**). The UI processor **102** controls the UI **101** and notifies the user of the number of pages whose scanning is finished. The input processor **104** sends the screen display request to the UI processor **102**, and sends a notification on processing progress to the process processor **1001** (step **S1306**).

After receiving the notification from the input processor **104**, the process processor **1001** immediately starts the processing on the input image information based on the stored process processing request. The process processor **1001** finishes the processing, and thereafter, sends a screen display request to the UI processor **102** every time one-page processing is finished (step **S1307**). The UI processor **102** controls the UI **101** and notifies the user of a message "completion of image processing". The process processor **1001** sends the screen display request to the UI processor **102**, and sends a notification on processing progress to the output processor **109** (step **S1308**).

After receiving the notification from the process processor **1001**, the output processor **109** immediately starts outputting the image information processed by the process processor **1001** based on the stored output processing request. The output processor **109** finishes the output processing, and sends a screen display request to the UI processor **102** every time one-page plotting is finished (step **S1309**). The UI processor **102** controls the UI **101** and notifies the user of the number of pages whose plotting is finished.

As shown in FIG. **14**, a request-corresponding key **1401** corresponding to the request **1101** of the request-decomposition rule book **1100** can be created, and the created request-corresponding key **1401** can be displayed on the UI **101** such as a touch panel. FIG. **14** is a schematic of an example of the UI **101** displaying the request-corresponding keys **1401** thereon. When the request-corresponding key **1401** is displayed on the UI **101**, the user presses the request-corresponding key **1401**, and the UI processor **102** creates a request processing command related to the request-corresponding key **1401**. The created request processing command is decomposed by the request processor **103** according to the request-decomposition rule book **1100**. This allows the user to intuitively operate the UI **101**.

As explained above, the image processing apparatus **1000** includes the request processor **103** that can send a processing request to the process processor **1001**, and the request-decomposition rule book **1100** can interpret the request **1101** containing the process mode **1103**. Therefore, a desired request can be flexibly set.

Furthermore, when the request processor **103** collectively transmits request processing commands to the output processor **109**, the process processing request is automatically sent from the output processor **109** to the process processor **1001**, and the input processing request is also automatically sent from the process processor **1001** to the input processor **104**. Accordingly, the number of processing requests sent by the request processor **103** can be reduced and the processing time of the request processor **103** can also be reduced.

In the explanation with reference to FIGS. **12** and **13**, the request processing command is the copy for material, but the

request processing command is not limited thereto. The user can also register frequently-used request processing command. Furthermore, the transmission-timing rule book can also be used after step **S1202**, as used in the first embodiment although it is not shown. For example, in the case of the "copy for material" shown in the second embodiment, the transmission-timing rule book will be "process (processing request) is sent after input (processing request) is sent, and immediately after sending the input, output (processing request) is sent".

In the second embodiment, the single operation (copy) in the first embodiment is explained as the example. However, the operation as shown in the second embodiment can be used for the case of the combined operations in the first embodiment. For example, input image information is processed to be copied, and the processed image information can be transmitted by fax. In the case of the combined operations, as shown in the first embodiment, the processing can be performed only once if the same mode is included in the input modes and the output modes.

The image processing method according to the first and the second embodiments can be implemented by causing a computer, such as a personal computer or a work station, to execute a previously prepared program. The program is implemented by being recorded in a computer-readable recording medium such as an HD, an FD, a Compact Disk Read Only Memory (CD-ROM), an MO, and a DVD, and being read by the computer from the recording medium. The program can also be a transmission medium capable of being distributed through a network such as the Internet.

According to an aspect of the present invention, the time required for the image processing can be reduced.

Although the invention has been described with respect to a specific embodiment for a complete and clear disclosure, the appended claims are not to be thus limited but are to be construed as embodying all modifications and alternative constructions that may occur to one skilled in the art that fairly fall within the basic teaching herein set forth.

What is claimed is:

1. An image processing apparatus comprising:

- a plurality of input units each configured to perform input processing including receiving input of image information;
- a receiving unit that receives a plurality of operation requests that indicate how the image information is to be processed;
- a plurality of output units configured to perform output processing including outputting processed image information;
- a request interpretation unit that interprets the operation requests and, for at least one operation request of the plurality operation requests, determines a combination of (a) at least one first input unit among the plurality of input units and (b) first and second output units among the plurality of output units corresponding to the operation requests;
- a storing unit that stores timing rules indicating first and second specific timings at which the first and second output units, respectively, initiate output in connection with the received image information, relative to a time when the first input unit begins input processing of the received image information, in connection with the one operation request; and
- an input/output-processing request unit that (A) determines, based on the transmission-timing rules, whether each of the first and second output units is to initiate outputting the image information (i) immediately after the first input unit begins input processing of the image



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information and before the first input unit has completed the input processing, or (ii) only after the first input unit has completed input processing of the image information, and (B) requests the first input unit to begin input processing of the received image information, and requests the first and second output units to output the processed image information in accordance with the determination in (A), in connection with the one operation request.

2. The image processing apparatus according to claim 1, further comprising a storage unit that stores therein a rule to interpret the operation requests, wherein

the request interpretation unit decides the combination of the first input unit and the first output unit based on stored rule.

3. The image processing apparatus according to claim 2, wherein the storage unit stores therein an input timing of requesting the input processing to the first input unit, and said first specific timing of requesting the output processing to the first output unit, and

the input/output-processing request unit requests the input processing to the first input unit and requests the output processing to the first output unit, based on said stored input timing and stored first specific timing.

4. The image processing apparatus according to claim 1, wherein the first input unit can be one unit while the first output unit can be a plurality of units.

5. The image processing apparatus according to claim 1, further comprising:

a plurality of process units each of which performs a unique process on the image information received via the input units; and

a storage unit that stores therein a rule to decide a combination of at least the first input unit, a first process unit from among the process units, and the first output unit, wherein

the request interpretation unit decides a combination of the first input unit, the first process unit, and the first output unit based on stored rule, and

the input/output-processing request unit requests the input processing to the first input unit, requests process processing to the first process unit, and requests the output processing to the first output unit.

6. The image processing apparatus according to claim 5, wherein

the input/output-processing request unit transmits to the first output unit, first request information for the input processing, second request information for the process processing, and third request information for the output processing,

the first output unit transmits received first request information and second request information to the first process unit, and

the first process unit transmits received first request information to the first input unit.

7. The image processing apparatus according to claim 5, wherein the first and second specific timings indicate first and second minimum times after which the first and second output units, respectively, may initiate output of the image information, as measured from a process time when the first process unit performs processing on the image information.

8. The image processing apparatus according to claim 1, wherein the first specific timing indicates a minimum time, after said time when the first input unit begins receiving the input of the image information, when the first output unit may initiate output of the image information.

9. The image processing apparatus according to claim 1, wherein the first specific timing is immediately after said time

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when the first input unit begins input processing of the image information, if the first input unit is a scanning unit or recorded information unit, and the first output unit is a plotting unit.

10. The image processing apparatus according to claim 1, wherein the second specific timing indicates a minimum time, after said time when the first input unit receives input of the image information, when the second output unit may initiate output of the image information.

11. The image processing apparatus according to claim 1, wherein the second specific timing is after the first input unit completes input processing of the image information, if the first input unit is a scanning unit and the first output unit is a fax transmission unit.

12. The image processing apparatus according to claim 1, wherein the timing rules indicate a plurality of specific timings, corresponding to combinations of respective ones of the plurality of input units with respective ones of the plurality of output units.

13. The image processing apparatus according to claim 1, wherein the input/output-processing request unit requests the first output unit to initiate outputting the image information, immediately after the first input unit begins input processing of the image information, and requests the second output unit to initiate outputting the image information, only after the first input unit has completed input processing of the image information.

14. A method of processing image information on an image processing apparatus including a plurality of input units each configured to perform input processing including receiving input of the image information and a plurality of output units configured to perform output processing including outputting processed image information, the method comprising:

receiving a plurality of operation requests that indicate how the input image information received through the input unit is to be processed;

interpreting the operation requests and, for at least one operation request of the plurality operation requests, determining a combination of (a) at least one first input unit among the plurality of input units and (b) first and second output units among the plurality of output units corresponding to the operation requests;

storing timing rules indicating first and second specific timings at which the first and second output units, respectively, initiate output in connection with the received image information, relative to a time when the first input unit begins input processing of the received image information, in connection with the one operation request;

(A) determining, based on the transmission-timing rules, whether each of the first and second output units is to initiate outputting the image information (i) immediately after the first input unit begins input processing of the image information and before the first input unit has completed the input processing, or (ii) only after the first input unit has completed input processing of the image information; and

(B) causing the first input unit to begin input processing of the received image information, and requesting the first and second output units to output the processed image information in accordance with the determination in (A), in connection with the one operation request.

15. A computer program product comprising a non-transitory computer usable medium having computer readable program codes embodied in the medium that when executed causes a computer to execute the image processing method according to claim 14.